NATIONAL STONE, SAND & GRAVEL ASSOCIATION

Natural building blocks for quality of life

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Mr. Daniel A. Meer, Chief
United States Environmental Protection Agency
Response, Planning and Assessment Branch
Superfund Division

Ms. Jere Johnson
United States Environmental Protection Agency
Superfund Division (SFD-9-1)
75 Hawthorne Street
San Francisco, CA 94105

RE: Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project

This letter serves as the National Stone, Sand & Gravel Association's (NSSGA) response to your request for detailed information dated March 9, 2006. Since receipt of that request, the NSSGA has received a copy of the Environmental Protection Agency (EPA) Region 9's April 20, 2006, official response to the RJ Lee Group Report. Because both documents are related to the same subject, it has required more time than initially anticipated to compile a thorough response. NSSGA has requested that one of its consultants, RJ Lee Group Inc., respond to EPA's technical questions in a separate submittal covering the assertions and issues raised in the two documents. For purposes of completeness, the NSSGA response for the EPA Headquarters distribution list includes the RJ Lee Group, Inc. submittal.

NSSGA's Experience with Environmental Implications of Mining Aggregates

The NSSGA is the world's largest mining association by product volume, according to the U.S. Geological Survey. Its member companies employ 117,000 men and women who produce 92 percent of the crushed stone and 75 percent of the sand and gravel (construction aggregates) used annually in the United States. Sales of natural aggregates generate nearly $38 billion annually for the U.S. economy. During 2005, a total of about 3.2 billion tons of crushed tone, sand and gravel, valued at $17.4 billion, were produced and sold in the U.S.

Aggregates are used in nearly all residential, commercial and industrial building construction and in most public works projects, such as roads, highways, bridges, railroad beds, dams, airports, water and sewage treatment plants, and tunnels. While the American public pays little attention to these raw natural materials, they go into the manufacture of asphalt, concrete, glass, paper, paint, pharmaceuticals, cosmetics, chewing gum, household cleansers and many consumer goods.

Aggregates also have a number of significant environmental protection applications, including erosion control and slope protection with dams, along roadways and bridges, along shorelines, navigation channels, rivers, stream banks, construction site exits and runoff control and wetland and stream restoration; for filtration in sewage treatment, wastewater control, septic tank leaching fields and infiltration for aquifer replenishment; for flue gas de-sulfurization for acid neutralization in streams, lakes and on agricultural land; for reclamation of mine sites as backfill and land cover; in landfills and waste disposal operations as leachate and gas collection layers, covers and protection and for leachate pH adjustment; in concrete and asphalt materials used in construction for public works infrastructure, to mention just a few.

NSSGA's *Environmental Guiding Principles,* adopted as Association policy by its Board of Directors on January 20, 1991, state in part:

> "The National Stone, Sand & Gravel Association.... believes that environmental laws and regulations should be based on sound scientific, engineering and medical principles. To this end, NSSGA will work with lawmakers and regulators and make available the expertise of its members, staff and research facilities to help in shaping the nation's environmental policies."

NSSGA has a long history of working cooperatively with government agencies, including EPA, in making the results of its research and expertise available to decision makers and regulators at all levels of government. An example is the 15-year, ongoing cooperative program with EPA, and relevant state agencies, to measure and evaluate particulate emissions to the ambient air from aggregates operations. The data from the emissions testing program have resulted in accurate particulate emission factors, which are now included in EPA's AP-42 technical reference publication used by EPA and state air regulatory agencies.

NSSGA Requests National EPA Headquarters to Resolve the NOA Issue

It is apparent from Region 9's official April 20th response to RJ Lee Group's *Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project* (RJ Lee Group Report) that there are serious differences of opinion between NSSGA's many consulting scientists and EPA Region 9 regarding the health effects of cleavage fragments, the optical, mineralogical and chemical properties of asbestos versus cleavage fragments, and Region 9's proposed expansion of the definition of asbestos to encompass common rock-forming minerals that are present in over thirty percent of the nation's continental land surface.

As documented in this response, the character of fibers described as asbestos fibers in the RJ Lee Report is consistent with well-established mineralogical research concerning the correct identification of asbestos. It is also consistent with the most current health risk assessment research concerning generic or general fiber dimension, including the Berman Crump Protocol[1] and the findings of the referenced May 2003 Peer Consultation Workshop[2] on that protocol. In contrast, the character of particles counted as asbestos fibers in the EPA El Dorado Study is inconsistent with current scientific knowledge and the Berman Crump Protocol and even the current EPA IRIS[3] risk assessments. The ultimate consequence of not correcting this discrepancy will be the issuance of an incorrect and scientifically inaccurate risk assessment which will mistakenly alarm the public and adversely impact local government bodies and economies.

After a comprehensive review by multiple, world-recognized asbestos experts, including experts in human epidemiology[4], animal[5] and cellular toxicology[6] (attached), the mineralogy and geology of asbestos[7,8], the optical and electron microscopic analysis of asbestos and cleavage fragments[9,10] and the risk assessment methods and approaches involved with asbestos[11,12], the NSSGA is convinced that there is an urgent need for an unbiased, comprehensive, independent review of the science addressing the definitions and measurement of NOA so the nation can proceed with an accurate standardized risk assessment method to ensure that public health is protected and unwarranted economic chaos is avoided. The successful model for such a review can be taken from the work of previous asbestos-related working groups enlisted by the Health Effects Institute (HEI)[13], which has a 25 year history of working with EPA on a variety of issues affecting public health, and the National Academy of Sciences (NAS)[14]. The NSSGA urges the EPA national headquarters to expeditiously commission an independent review with either the HEI or the NAS.

This national review is crucial since the approach currently being pursued by Region 9 is precedent-setting by its advocacy of a grossly over-inclusive definition of asbestos which incorporates certain common rock-forming, non-asbestiform minerals that meet simple and arbitrary analytical dimensional counting criteria adopted in 1958 by the asbestos textile industry[15]. This use of an arbitrary dimensional counting criteria to apply a risk factor derived from environments that are essentially free of rock fragments to an environment in which rock fragments constitute the vast majority (if not all) of the particles being characterized in the analysis has serious unintended consequences and is not protective of public health. In addition, Region 9's proposed approach is non-peer reviewed and is derived from data with serious quality assurance and control issues[16]. The expansion of the asbestos definition, without the presentation of any scientific justification, to common rock-forming minerals will impact ***billions of tons*** stone that comprise the current and future infrastructure of the country. To emphasize Region 9's departure from precedent, the United States government currently does not regulate cleavage fragments as if they were asbestos in any context.

This response addresses some relevant background issues and then sets forth the scientific basis for the conclusions reached in the RJ Lee Group analysis as well as highlighting the relevant risk issues as analyzed by Dr. D. Wayne Berman, with supporting documentation separately attached.

The NSSGA has a Consistent and Long Record for Advocating Sound Science in Asbestos Regulation

The NSSGA has intensively studied the NOA issue since the Occupational Safety and Health Administration (OSHA) promulgated its 1986 asbestos standard[17] that included non-asbestiform actinolite, tremolite and anthophyllite minerals. These non-asbestiform minerals were removed from the asbestos standard after a six-year administrative stay during which the cleavage fragment health issue was studied in depth and OSHA concluded that they did not warrant regulation as if they were asbestos[18]. The science on which that decision was based has become even more supportive over the past 20 years [1,2,4,5,6,19,20,21,22].

NSSGA believes that in order to protect public and worker health, there should be strict regulation of harmful exposure to asbestos, whether it occurs from handling commercially produced asbestos products or occurs in the natural environment. In testimony before the U.S. Mine Safety and Health Administration (MSHA) in 2002[23], the NSSGA put forward its position that ***all*** asbestiform amphiboles (including winchite and richerite, as well as others) and wooly erionite, an asbestiform zeolite, be regulated as strictly as asbestos at the lower permissible exposure limit used by OSHA.

In order to achieve this goal, NSSGA believes it is very important to public health and proper risk assessment to establish an accurate mineralogical and regulatory definition of the term, "asbestiform." As shown in the enclosed document, *The Asbestiform and Prismatic Mineral Growth Habit and Their Relationship to Cancer Studies – A Pictorial Presentation,* the NSSGA has relied upon consensus definitions from world-recognized experts in asbestos mineralogy[24] as well as EPA's own definition[25] of the asbestiform mineral growth habit which is as follows:

> *Asbestiform mineral fiber populations generally have the following characteristics when viewed by light microscopy:*
>
> 1. *Mean aspect ratios ranging from 20:1 to 100:1 or higher for fibers longer than 5 micrometers,*
> 2. *Very thin fibrils, usually less than 0.5 micrometers in width,*
> 3. *Parallel fibers occurring in bundles, and*

4. *One or more of the following:*
    a. *Fiber bundles displaying splayed ends*
    b. *Matted masses of individual fibers,*
    c. *Fibers showing curvature*

Exposure to asbestos fibers with the above properties was the type that the workers experienced in the epidemiological studies used by EPA's Integrated Risk Information System (IRIS) and OSHA's asbestos risk assessments. Mixed dust environments, which have substantial concentrations of cleavage fragments, were explicitly excluded from EPA's and OSHA's risk assessment derivations. This omission is extremely informative because studies containing substantial cleavage fragment exposure (e.g. Quebec chrysotile miners) uniformly show a significantly lower dose-response than what is seen in studies of commercial asbestos[26]. This is because these cleavage fragments (in the case of chrysotile miners - antigorite and lizardite, which have not been shown to cause asbestos-like disease) were mistakenly counted as asbestos, thereby inflating the dose relative to the response[27].

NSSGA's position is based upon numerous published epidemiological and health studies of human, animal and cellular toxicity that, as recently as last year, have been reviewed by international experts in their respective fields that show that cleavage fragments do not pose asbestos-like risks[4,5,6]. The NSSGA also bases its position on OSHA's six-year review of its 1986 asbestos standard on whether to include rock fragments of the asbestos minerals in the standard[18], the late 1980's U.S. Consumer Product Safety Commission (CPSC) decision regarding tremolite cleavage fragments in play sand[28] and the more recent decision concerning "asbestos" in crayons[29], the data and epidemiological studies underlying OSHA's quantitative risk assessment[18] and EPA's IRIS update[3]; and the latest science regarding fibers that pose the most risk, the Berman Crump Protocol[1]. This massive library of science, representing years of research and conclusions, clearly indicates that exposure to common rock fragment counterparts of the more rare asbestiform varieties of the same minerals do ***not*** cause asbestos-related diseases.

<u>Asbestos Measurement in Occupational and Ambient Environments</u>

To fully respond to EPA Region 9's request of NSSGA, it is important to make a few background points relevant to the analytical methodologies at issue for estimating exposure to asbestos that has become dispersed in an outdoor, non-occupational setting. This type of exposure has come to be called naturally occurring asbestos or "NOA", even though, of course, all asbestos is "naturally occurring." The NOA designation points to the fact that the exposures at issue are due to geological occurrences of asbestos that may have become dispersed generally in the ambient, outdoor environment as the result of incidental disturbances, such as construction activities, rather than due to indoor, occupational exposures that occur as the result of intentional handling of commercial asbestos products.

As long recognized by OSHA and other regulatory agencies, including EPA, regulation of any asbestos risks must be based on sound techniques for identifying and estimating the presence and toxicological significance of asbestos fibers. This issue takes on special importance in the context of NOA since typically these exposures occur in the context of dispersed air and water contaminations that are difficult to identify, measure or estimate the health effects. These analytical challenges, however, do not legitimize basing NOA regulatory policy on conventional occupational exposure approaches that are scientifically invalid in the context of NOA.

The methodology used by Region 9's contracting laboratory, Lab/Cor, is based on a particle counting convention that was developed decades ago in the context of estimating exposure to asbestos fibers in occupational settings where asbestos was in commercial use. In such settings, high concentrations of asbestos fibers were known to exist and workers were exposed to them for relatively long periods of time. Because scientists used microscopy to estimate the exposure levels, they developed an estimating methodology based on counting as "asbestos" any particle they could see that was longer than 5 microns and had a ratio of length to width of 3:1 or greater[15].

The use of this approach to estimate NOA exposures is scientifically invalid because it allows simple counting criteria for known asbestos environments to be used to "define" asbestos in unknown asbestos environments containing mixed dust. Mineralogists do not, and have never defined asbestos fibers according to simple shape characteristics such as "longer than 5 microns with a minimum aspect ratio of 3:1." This description in fact could apply to many different non-asbestos minerals that do not have other physical, chemical or toxicological properties of asbestos. Thus, as detailed at much greater length below, mineralogists have evolved a number of techniques to identify asbestos particles in airborne dust and other environmental samples of unknown origin based upon an array of appropriate physical, chemical and optical properties as well as population-based generalizations about fiber length, diameter and aspect ratio[7,8,9,10,30,31,32].

These identification criteria developed by mineralogists differ significantly from the "longer than 5 um, minimum 3:1 aspect ratio" occupational exposure counting convention and, used cumulatively and with insight by skilled mineralogists, result in much more accurate asbestos identification and quantification. Indeed, RJ Lee's analysis applied many of these mineralogical criteria to conclude that Lab/Cor's inappropriate use of the conventional counting methodology to identify the mineral composition of samples collected from the ambient environment of El Dorado Hills results in highly inflated estimates of asbestos fibers in that environment. As the RJ Lee analysis shows, affirmed by three peer reviews and two subsequent reviews by Dr. Catherine Skinner and Mr. John Addison, both noted mineralogists, Lab/Cor inaccurately identified a large proportion of elongated prismatic or non-asbestiform particles as harmful asbestos fibers.

In short, the counting criteria used by Region 9 cannot distinguish asbestos from non-asbestos and therefore provides no basis for estimating exposures to the physical, chemical or toxicological properties of asbestos that pose human health risks. An agency seeking to regulate asbestos exposure must use an appropriate and scientifically valid methodology for identifying the exposure levels and related risks. In the case of NOA, it is invalid to use an arbitrary analytical construct (i.e., a particle counting criteria) to define a mineral-based health risk. Any analytical protocol for NOA must be based on the best mineralogical science available for identifying and estimating the amount of asbestos in the ambient environment. There is no role for overly broad, simplistic fiber counting criteria in asbestos identification or risk estimation.

The actual history behind the adoption of the 3:1 aspect ratio is also informational for understanding the deficiencies inherent in EPA's current protocol as it pertains to mixed dust environments. In the second half of the twentieth century, UK and US scientists seeking to help employers estimate the occupational exposure of their workers to asbestos in factories involved in commercial usage of asbestos developed a "counting" methodology that consisted of collecting air samples on a filter and then, using a phase-contrast light microscope, counting as asbestos any mineral particles that had a length of 5 um or longer and had an aspect ratio (i.e., ratio of length to diameter) of at least 3:1.

The 3:1 aspect ratio was not based on any scientifically valid definition of asbestos characteristics or the toxicological significance of such characteristics, but reflected a need to improve consistency in exposure measurements by analysts. Since fiber counting analysis was performed using a phase-contrast light microscope at a magnification of 400-450x which made the minimum identifiable width 0.2-0.25 um, and since asbestos fibers may be as small as 0.02 um in diameter, there was recognition that the measurement was only serving as an ***index of exposure*** versus an absolute quantification of asbestos fibers. The researchers found that the 5 um, 3:1 counting convention resulted in the most consistent counting outcomes[15].

Since this convention was used with respect to counting particles known to have originated in a setting where asbestos was commercially in use and where the primary elongated particles present could reasonably be assumed to be asbestos, this convention, which does not require the analyst to identify asbestos, made sense in that setting. In the 1970s, the approach was adopted by the federal governments in both countries for the limited purpose of estimating asbestos exposures in occupational settings, where typically asbestos fibers were known to exist in significant quantities. Phase contrast microscopy has continued to be the method of choice for the measurement of occupational exposure to asbestos because it is inexpensive and can be performed quickly on-site.

However, it is widely recognized that this traditional counting approach is wholly inadequate to identify asbestos fibers in other environments where elongated particles may or may not be asbestos. The main disadvantage of the approach is that it does not positively identify asbestos fibers, which requires polarized light and/or electron microscopy coupled with the analyst's knowledge and practical experience utilizing these tools to identify minerals. In addition, because the PCM method is unable to see fibers that are less than about 0.2 um in diameter, in some cases substantially more asbestos fibers may be present than are actually counted by the method. This is also true with the PCME methods since, even though the methods use the electron microscope, they also use the simplistic PCM counting criteria.

The conventional counting method is particularly inadequate to identify asbestos fibers in the context of NOA where particles are collected from the ambient, natural environment, such as in El Dorado Hills. There are simply too many non-asbestiform amphibole particles that fit the 5 um, 3:1 definition in such an environment. In these circumstances, the failure to accurately identify and estimate the presence of asbestos fibers, and thus to accurately estimate potential human exposure, can have disastrous consequences. Overestimations can result in unwarranted public panic and costly remedial actions, as well as associated adverse consequences for local economic activities. More importantly, underestimations can result in failures to protect public health adequately. Both errors adversely impact our understanding of asbestos and general fiber risk and therefore do not serve the best interest of anyone.

Thus, the conventional method for counting asbestos fibers, while perhaps adequate in the occupational setting for which it was devised, is severely inadequate for use in evaluating risks from NOA (or indeed, risks from asbestos exposures in other non-occupational environments, such as on city streets from tires, for example).

There is not a divergence of opinion within the scientific community about the appropriate methods for identifying asbestos. The fact is that current analytical methods were designed to measure commercial asbestos in relatively simple matrices not in ambient mixed dust environments. Blindly using existing methods without applying what is known about asbestos mineralogy and morphology is inadequate to assess risk, and in some cases, inflates risk. NSSGA's only goal is to work with Region 9/EPA to produce an accurate protocol for identifying and assessing NOA risks.

Dr. Berman's Evaluation Confirms Inadequacy of Region 9's Approach in El Dorado Hills

The NSSGA, shares EPA's deep concern about the health effects of naturally occurring asbestos (NOA). The NSSGA wants to insure that the American public receives the best available, most accurate and scientifically sound information on which to base responsible public health and policy decisions. In continuing pursuit of that objective, the NSSGA commissioned Dr. D. Wayne Berman, one of the nation's premier asbestos risk assessors, especially as it pertains to mixed dusts in natural environments, to examine the May 2005 EPA Region 9 El Dorado Hills Study and to address the health risk issues.

Based on his extensive experience in assessing asbestos risks in both commercial asbestos and NOA environments, Dr. Berman is eminently qualified to review the EPA El Dorado Hills Study. Dr. Berman's relevant expertise in this area includes design and/or management and oversight of the original EPA risk assessments of the Atlas Mine Site, Coalinga Mill Site, Clear Creek Management Area, Diamond XX Site, and the Southdown Quarry. He also contributed to the EPA work at Libby, MT. Dr. Berman has also conducted assessments of asbestos-related risks at the Johns-Manville Waukegan Facility, the Klamath Falls - North Ridge Estates Site, the 3rd Street Light Rail Project Site for the City of San Francisco, and other sites around the country. Dr. Berman has also served as the sole non-government member of the National Asbestos Task Force for the EPA, where he developed a set of mutually consistent methods for determining asbestos concentrations in environmental media that are unique because results can be related to risk. These methods have been published by EPA as interim EPA Superfund Methods. Most importantly, Dr. Berman pioneered an approach for the evaluation of asbestos-related risks that was reviewed favorably in 2003 by eleven nationally recognized asbestos experts. Dr. Berman's report[33] on El Dorado County is provided as an attachment to this letter.

One of the main findings of the Berman report is "that the [EPA-proposed] approach [for assessing risk in El Dorado County] may not be as well established by precedent as the approaches that the Agency commonly employs for other hazardous materials." Thus, in order for EPA to effectively protect public health, NSSGA believes it is imperative that EPA conduct a thorough review of its asbestos risk assessment approach because, if the EPA approach is applied uniformly to mixed dust environments, ***it will be less protective of public health*** than other approaches already available (e.g. the Berman Crump Protocol). The Berman Crump Protocol accounts adequately for the differences between cleavage fragments and asbestos due primarily to the size range of the risk fibers as explained in detail in the attached report by Dr. Berman.

Some of the key findings from Dr. Berman's report are:

The EPA approach at El Dorado ***does not*** satisfy two fundamental criteria that are essential for assuring that risk assessments are reliable, namely:

- exposure concentrations determined in terms of the PCMe metric used by EPA in El Dorado County are ***not*** directly comparable to the PCM-based exposures evaluated in the epidemiology studies used to derive the risk factors in IRIS (Current).

- The PCMe exposure metric has been shown ***not*** to remain reasonably proportional to risk across different exposure environments, especially mixed dust environments like El Dorado Hills.

Dr. Berman points out that EPA is citing IRIS as the comparison basis for exposures in El Dorado Hills yet the minimum width of fibers defined for PCMe structures in IRIS is twice the minimum width of fibers defined in the ISO analytical method employed in the study. IRIS further indicates that the correlation between PCM and TEM fiber counts is "highly uncertain." This inconsistency with IRIS makes the approach proposed by Region 9 even more problematic with respect to El Dorado Hills.

The NSSGA has obtained and photographed bulk asbestos samples that are examples of the source of exposures in the various epidemiological studies used in the EPA IRIS risk assessment. These photographs, first shown optically and then by digital SEM, are attached. Figure 1a is an optical image of chrysotile asbestos grade 3, which was typical for use in asbestos textile manufacturing, and Figure 1b is the same material shown under SEM. Figure 2a is an optical image of chrysotile asbestos grade 4, which was typical for asbestos insulation and asbestos cement pipe manufacturing. Figure 2b is the same material shown under SEM. Figure 3a is an optical image of chrysotile asbestos grade 7 which was typical for asbestos used in friction parts and asbestos containing gaskets and is noticeably less "pure" than grades 3 and 4. Figure 3b is the same material shown under SEM. Figure 4a is an optical image of raw Quebec chrysotile asbestos ore, which clearly shows significant quantities of rock fragments mixed with the asbestos fibers. The epidemiological studies whose workers were exposed to this mixed dust environment were excluded from IRIS and OSHA's risk assessment calculations. Figure 4b is the same material shown under SEM. Finally Figure 5a is an optical image of the El Dorado soil obtained from the EPA split samples. Figure 5b is the same material shown under SEM. It is readily apparent that the soil sample is in no way comparable to the IRIS excluded chrysotile ore sample (Figure 4), and it is even much less comparable to the samples that represent the source material for the studies included in EPA's IRIS risk assessment (Figures 1 - 3). EPA Region 9's proposal to apply the IRIS risk assessment factors to the El Dorado Hills data is clearly not appropriate based simply on an examination of the photographs, however, the multitude of other factors pointing to the absence of asbestos (i.e. aluminum content, extinction angle, dimensional characteristics and asbestiform morphological properties) make this even more unreasonable.

Dr. Berman also demonstrates that PCM/PCMe ratios used in risk assessment over the past 20 years have not been uniform and that it does not appear that these approaches have been subjected to formal peer-review at EPA. Studies of the PCM/PCMe exposure metric's ability to predict risk have been formally tested and have been shown to provide a ***statistically significant <u>lack</u> of fit*** among relatively "pure" asbestos exposures. It is highly likely that the fit would be even worse with a mixed dust environment like El Dorado Hills.

One of the most important observations discussed in the attached report by Dr. Berman is that prior to the current EPA study in El Dorado Hills, the Berman Crump Protocol consistently provided higher estimates of risk at sites where amphibole asbestos was a contributor to exposure than either IRIS or other traditional EPA approaches. When applied to the EPA study of El Dorado Hills, however, this appears not to be the case. This strongly suggests something is radically different about the locations tested in El Dorado Hills when compared to every known asbestos environment that has been previously modeled using the Berman Crump approach.

The NSSGA, and an extremely knowledgeable group of mineralogists with decades of experience in asbestos mineralogy (Dr. Malcom Ross, Dr. Ann Wylie, Dr. Catherine Skinner, Dr. Art Langer and John Addison - CVs attached), are of the opinion that the lack of consistency with the historical trends in the relative risk estimated using various approaches is because there was essentially no asbestos in the samples collected in the EPA study of El Dorado Hills[34,35,36,37,38].

<u>Five Asbestos Mineralogists with Decades of Experience Confirm the RJ Lee Group Conclusions</u>

Asbestos is known to be present in the El Dorado Hills area. In fact, RJ Lee Group found amphibole asbestos some 200 yards from the EPA test site. The issue here is that there was little to no asbestos present in the samples collected by EPA in their study.

<u>EPA's Selected Method</u>

Lab/Cor indicated that it used ISO 10312[39] when analyzing samples collected in El Dorado Hills. This method is based on the traditional counting approach, counting fibers longer than 5 um, but uses a longer aspect ratio (5:1 instead of 3:1). However, as documented in the RJ Lee Report, Lab/Cor used the conventional 3:1 ratio to count asbestos fibers for the El Dorado Hills analysis, even though it did not report this modification on its laboratory reports.

Use of historical counting convention, to *identify* asbestos when examining mineral particles of unknown origin, is a wildly inexact science. Lab/Cor's substitution of the 3:1 ratio rather than the 5:1 ratio mandated in the ISO standard is particularly disturbing in this case, since ISO 10312, as the standard states itself, cannot distinguish between asbestos fibers and non-asbestos particles at a 5:1 aspect ratio, let alone an even less discriminating 3:1 aspect ratio. Thus, using ISO 10312, combined with an over-inclusive aspect ratio, necessarily results as the RJ Lee Group analysis demonstrates, in inflated reported asbestos concentrations.

Aluminum Content of Particles are Not Characteristic of Asbestos

The RJ Lee Group looked at the electron dispersive x-ray analyses (EDXAs) that Lab/Cor had performed on a representative sampling of amphibole (actinolite) particles, and found that the detailed mineralogical analyses showed that 63% of the reported amphibole actinolite particles Lab/Cor identified as asbestos fibers contain too much aluminum to be asbestos (i.e., they contained more than 1.5 percent aluminum). It is well-established in the scientific literature that particles classified as amphibole asbestos contain only trace quantities of aluminum since the amount of aluminum in the mineral's formation stage influences whether an amphibole mineral develops the asbestiform growth habit[9,40,41]. Because a fiber is composed of highly aligned chemical units, there is no room to accommodate larger atoms such as aluminum, and the presence of too much aluminum will result in structural changes that cause prismatic crystals (i.e., the non-asbestiform habit) rather than the characteristic bundle of fibrils (asbestiform growth habit) necessary for the minerals that are regulated and defined as asbestos to develop.

Three mineral scientists, who have decades of experience in asbestos mineralogy, peer-reviewed the RJ Lee Group analysis and all noted that the reported aluminum levels of the particles in the El Dorado Hills study were inconsistent with Lab/Cor's identifying the particles as asbestos. Dr. Ann G. Wylie, a nationally recognized mineralogical expert, stated that the amount of aluminum present in many of the elongated particles identified as asbestos is too high for these particles to be asbestos. Dr. Wylie, along with Jennifer Verkouteren (a mineral scientist at the National Institute of Standards and Technology), is the author of research published in the American Mineralogist in 2000, which completely analyzed 103 members of the amphibole series and found that the total amount of aluminum in atoms per formula unit for samples of asbestos was less than 0.3 .

Similarly, Dr. Arthur Langer, a world-recognized asbestos mineralogist with extensive publications on NOA issues, and Dr. Malcolm Ross, retired USGS mineralogist specializing in asbestos, both stated that that the high aluminum content of the 63% of particles Lab/Cor identified as "actinolites" should be classified, using established mineralogical nomenclature, as common hornblende cleavage fragments because they had greater than 0.5 aluminum pfu.

The RJ Lee Group also analyzed the aluminum content of splits of 23 soil samples collected from areas where EPA's activity-based sampling had indicated elevated asbestos fiber concentrations. They found that the amphibole minerals present in the soil samples, just as in the samples taken from air filters, contained elevated levels of aluminum consistent with hornblende and non-asbestiform actinolite rather than asbestos.

Dr. Catherine Skinner, a Yale mineralogist with extensive experience in asbestos, and Mr. John Addison, noted asbestos mineralogist in England, both reviewed the RJ Lee Group conclusions and generally confirmed them as well.

<u>*Extinction Angles of Particles are Not Characteristic of Asbestos*</u>
The RJ Lee Group analysis also found that the reported extinction angles for the soil samples EPA's contract laboratory identified as asbestos are inconsistent with asbestos fibers. TEM Asbestos Laboratories, also an EPA subcontractor, had analyzed the soil samples using polarized light microscopy (PLM) and concluded that the amphibole content was consistent with actinolite asbestos. However, the subcontractor also reported that the amphibole actinolite particles reported as asbestos in the soil samples had a reported extinction angle of 12 degrees. Noting that extinction angles above 10 are an intrinsic property of non-asbestiform cleavage fragments, whereas amphibole asbestos displays an extinction angle that is normally less than 10 degrees, the RJ Lee Group concluded that the amphibole particles reported in the soil samples cannot be asbestos. This conclusion was also consistent with lack of any asbestiform mineral habit morphology (fibrillar bundling) in the soil samples.

Dr. Wylie's peer-review confirmed this conclusion, stating that "The conclusion of the report that an extinction angle of 14 degrees is too large for asbestos is consistent with the findings Jennifer Verkouteren and I published in American Mineralogists in 2002, in an article entitled "Anomalous optical properties of fibrous tremolite, actinolite, and ferro-actinolite. ... When oblique extinction is observed in asbestos fibers in the tremolite-actinolite-ferroactinolite series, it is less than 10 degrees." Dr. Ross concurred with this finding as well, stating "Asbestos fibers grow as bundles of fibers oriented randomly about the common crystallographic c-axis. As such, the bundles behave optically as an orthorhombic mineral with a c-axis extinction angle of zero degrees."

<u>*Particle Dimensions are Not Characteristic of Asbestos*</u>
Criteria for identifying asbestos fibers in airborne dust and other non-occupational environmental samples must recognize not only appropriate chemistry and optical properties but also the fact that aspect ratios of asbestos fibers are generally extremely large: generally from 20:1 or higher for fibers greater than 5 um in length. Indeed, EPA's "Method for the Determination of Asbestos in Bulk Building Materials," EPA Report NO. EPA/600/R-93/116 (NTIS/PB93-218576), July 1993 (updates and replaces interim version in 40 CFR 763, Subpart F, App A), defines the term asbestiform in part by stating that the asbestiform habit is generally recognized by "*mean aspect [length to width] ratios ranging from 20:1 to 100:1 or higher for fibers longer than 5 micrometers ... very thin fibrils, usually less than 0.5 micrometers in width.*"

On the other hand, the far more common non-asbestiform crystal growth habit has distinctly different morphological characteristics[30]. In hand held specimens as well as microscopically, they appear as single crystal particles and, unlike asbestos fibers, particle width is dependent on length (i.e., the longest cleavage fragments are also the widest). Therefore they have a size range (length and width) that is distinctly different than asbestos fibers, there is no evidence of multiple crystals forming a single fiber bundle growing in parallel alignment (splayed ends, separation of the fiber), and they are brittle and therefore show little if any curvature as they break along cleavage planes rather than bend. Though these characteristics may be difficult to distinguish in the case of single, very small particle, they are unmistakable when observed on a population basis.

Understanding the nature of cleavage fragments is central to understanding any health risks posed by NOA. It is clear that amphibole minerals far more commonly exist in the non-asbestiform habit than in the asbestiform habit, and that they produce common, garden variety cleavage fragments when broken down. Further, mineral science tells us that once asbestos is formed in its unique crystal growth habit, it cannot form cleavage fragments. Conversely, cleavage fragments cannot be made into asbestos by any form of manipulation including weathering. Cleavage fragments are regarded by mineral scientists as distinctly different from asbestos fibers due to the marked difference in crystal growth of the two habits (fibrillar structure, strength or flexibility, particle dimensions, how they further break down, etc.). The key distinctions cannot be altered. Even though some cleavage fragments can be found with aspect ratios greater than 3:1, cleavage fragments are not asbestos at any size.

The distinction between asbestos fibers and cleavage fragments has been incorporated in most asbestos regulatory policy as well. Since at least 1984, as stated in a report on non-occupational exposure to asbestiform minerals commissioned by the National Research Council[14], cleavage fragments have been categorized as distinctive from asbestos fibers: "*CLEAVAGE refers to the preferential breakage of crystals along certain planes of structural weakness. ... A mineral with two distinct cleavage planes will preferentially fracture along these planes and will produce ACICULAR fragments. Minerals with one cleavage plane produce PLATY fragments and those with three or more cleavage planes yield POLYHEDRAL fragments.... Cleavage cannot produce the high strength and flexibility of asbestiform fibers.*" This critical and clear distinction has been extensively explained, graphically shown and photographed in the scientific literature.

Dr. Wylie and Dr. Langer in their review of the RJ Lee Report again confirm that the dimensions of the elongated particles identified as asbestos fibers by Lab/Cor are not consistent with the conclusions of years of mineralogical research on the dimensions of asbestos particles. "Asbestos populations have distinct and unambiguous dimensional characteristics that are readily distinguished from populations of cleavage fragments," Dr. Wylie states. Both Wylie and Langer point out that Lab/Cor reported that 96% of the El Dorado Hills Study particles that were longer than 5 um have widths greater than 0.5 um and that these dimensions are not consistent with a population of asbestos fibers. Particle size (especially when applied on a population basis) is an effective way to help distinguish asbestos from non-asbestiform, but it is not the only indicator. Other asbestos fiber properties also influenced by the asbestiform growth habit such as fiber extinction angle, fiber defect characteristics, evidence of fiber bundling and curvature can also be used to help make the distinction.

EPA's Mineralogical Expert's Use of Mineralogical Anomalies and Exceptions as General Rules for Asbestos Identification

Mr. Gregory Meeker, a geologist and electron probe analyst at USGS, serves as EPA's asbestos mineralogy expert. Mr. Meeker's use of mineralogical curiosities and exceptions to common asbestos mineralogy in his attempt to characterize the findings in the El Dorado Study as being consistent with asbestos mineralogy is more comprehensively addressed by RJ Lee Group's submission to EPA's original request and its response to the EPA April 20th formal critique of the RJ Lee Group Report, however, the NSSGA believes it is very important to highlight an example of this point.

Mr. Meeker[42] has characterized the NIST tremolite/actinolite standard 1867a as the "gold standard" by which asbestos can have more aluminum than what is cited in the literature or an inclined extinction angle in polarized light microscopy - just like cleavage fragments of these minerals. The NIST standard is in fact a mixture of asbestos and cleavage fragments of the same mineral as is clearly stated on the NIST certificate[43] that accompanies each and every vial of the standard. Meeker cites the information pertaining to the cleavage fragment portion of the NIST standard as if it was characteristic of the asbestiform portion of the standard. The aluminum and extinction angle parameters are but two facets in the analysis of asbestos along with parallel sides, the presence of bundles, very thin fibers, very high aspect ratios, splayed ends and curved fibers to name several. The particles measured and analyzed in the EPA El Dorado study lacked ***all*** of these characteristics of asbestos along with having too much aluminum and particles with an inclined extinction angle making the "asbestos" found in the samples the most unique asbestos thus far encountered in mineralogical science since they have no classically recognized asbestos properties.

EPA Region 9's Inclusion of Cleavage Fragments in its Asbestos Definition is Unprecedented for a US Enforcement Agency

EPA Region 9 has also maintained that, for purposes of risk assessment, there should be no distinction between cleavage fragments and asbestos fibers. However, the differences between cleavage fragments and asbestos are widely recognized by various agencies of the U.S. government and the intention to regulate rock fragments as asbestos has been consistently rejected as noted below:

- *"OSHA also reviewed available relevant evidence concerning the health effects of non-asbestiform tremolite, anthophyllite, and actinolite and examined the feasibility of various regulatory options. Based on the entire rulemaking record before it, OSHA made a determination that substantial evidence is lacking to conclude that non-asbestiform varieties of asbestos minerals present the same type of magnitude of health effect as asbestos."* **(OSHA, "Final Rule: Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite," 57 Fed. Reg. at 24310.)**

- *"In the asbestiform habit, mineral crystals grow forming long, thread-like fibers. When pressure is applied to an asbestos fiber, it bends much like a wire, rather than breaks. ... In the non-asbestiform habit, mineral crystals do not grow in long thin fibers. They grow in a more massive habit. For example, a long thin crystal may not be polyfilamentous nor possess high tensile strength and flexibility, but may break rather than bend. When pressure is applied, the non-asbestiform crystals fracture easily into prismatic particles, which are called cleavage fragments because they result from the particle's breaking or cleavage, rather than the crystal's formation or growth. ...Cleavage fragments are not asbestiform and do not fall within our definition of asbestos."* **(Mine Safety and Health Administration (MSHA), "Asbestos Exposure Limit" Proposed Rule, Notice of Public Hearing, 70 Fed. Reg. 43590, 43593, July 29, 2005.)**

- *"The optimal exposure index that best reconciles the published literature assigns equal potency to fibers longer than 10 µm and thinner than 0.4 µm and assigns no potency to fibers of other dimensions."* **(EPA, Final Draft: Technical Support Document for a Protocol to Assess Asbestos-Related Risk. (Berman and Crump Protocol) Prepared for Office of Solid Waste and Emergency Response, September 4, 2001 updated in 2003; Executive Summary, p. 1.4)**

- *"As your letter indicates, the AHERA definition of asbestos is 'the asbestiform varieties of: chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite.' This is also the definition used in EPA's National Emission Standards for Hazardous Pollutants (NESHAP) Asbestos Regulations. EPA does not regulate the non-asbestiform varieties of these materials."* **(Letter from Diane Sheridan, Chief of Abatement Programs Section, EPA, to John Kelse, R.T. Vanderbilt Company, Inc., August 28, 1992.)**

- *"This examination [of play sand sample] found fragments of non-asbestiform tremolite, but did not find tremolite asbestos. Some of the non-asbestiform tremolite cleavage fragments may appear, under some microscopy techniques, to fit a definition of "fiber" used by the Occupational Safety and Health Administration. The staff has conducted a review of the available information on* *non-asbestiform tremolite and concludes that there are no definitive animal or human studies demonstrating that non-asbestiform tremolite presents a health hazard."* **(U.S. Consumer Product Safety Commission, Briefing Package of the CPSC Office of the Secretary on a Petition to Ban Play Sand with Non-Asbestiform Tremolite, October 26, 1988, Executive Summary paragraphs 3 & 4.)**

In summary, please see the detailed response of the R. J. Lee Group for the technical information requested in your letter of March 9th and comments included in your April 20 report as well as the Dr. Wayne Berman report on the health concerns associated with the EPA approach to El Dorado Hills.

NSSGA believes there is an urgent need for an unbiased, independent and comprehensive review of the science around the definitions and measurement of NOA. NSSGA looks forward to working cooperatively and productively with EPA towards achieving this goal and believes that debating this complicated science in the media is unproductive and a disservice to the public. With this review, the various stakeholders, including other federal and state agencies, can proceed with an accurate standardized risk assessment method to ensure that public health is protected. The successful model for such a review can be taken from the work of previous asbestos-related working groups enlisted by the Health Effects Institute or the National Academy of Sciences and we urge EPA headquarters to commission an independent review with one of these two organizations as expeditiously as possible.

Respectfully Submitted,

William C. Ford
Senior Vice President

cc: Mr. Michael Cook
Dr. George Gray
Dr. Gerald Hiatt
Dr. Stephen Johnson
Mr. Wayne Nastri

REFERENCES

1. D. W. Berman and K.S. Crump (2003). "Technical Support Document for a Protocol to Assess Asbestos-Related Risk," EPA, U.S. Environmental Protection Agency, Revision of original from September 4, 2001, Peer-reviewed consultation held in San Francisco on February 25-26, 2003.

2. USEPA (U.S. Environmental Protection Agency) (2003). "Report on the Peer Consultation Workshop to Discuss a Proposed Protocol to Assess Asbestos-Related Risk, Final Report". Office of Solid Waste and Emergency Response, Washington D.C.

3. USEPA (U.S. Environmental Protection Agency) (1986) Airborne Asbestos Health Assessment Update, Report 600/8-84-003F

4. J. F. Gamble and G. W. Gibbs (2005). "An Evaluation of the Risks of Lung Cancer and Mesothelioma from Exposure to Amphibole Cleavage Fragments", Peer Reviewed, Revised and Accepted for Publication in Proceedings of the International Symposium on the Health Hazard Evaluation of Fibrous Particles Associated with Taconite and the Adjacent Duluth Complex, St. Paul, Minnesota, March 30-April 1, 2003.

5. J. Addison and E. E. McConnell (2005). "A Review of Carcinogenicity Studies of Asbestos and Non-Asbestos Tremolite and Other Amphiboles", Peer Reviewed, Revised and Accepted for Publication in Proceedings of the International Symposium on the Health Hazard Evaluation of Fibrous Particles Associated with Taconite and the Adjacent Duluth Complex, St. Paul, Minnesota, March 30-April 1, 2003.

6. B. T. Mossmann (2005). "Assessment of the Pathogenic Potential of Asbestiform vs. Nonasbestiform Particulates (Cleavage Fragments) in *In Vitro* (Cell or Organ Culture) Models and Bioassays", Peer Reviewed, Revised and Accepted for Publication in Proceedings of the International Symposium on the Health Hazard Evaluation of Fibrous Particles Associated with Taconite and the Adjacent Duluth Complex, St. Paul, Minnesota, March 30-April 1, 2003.

7. A. G Wylie (1989). "Mineralogical Definitions for Asbestos Fibers and Cleavage Fragments". Report of the Committee on Geology and Public Policy GPP012. Geology Society of America, p. 2-4.

8. A. M. Langer, R. P. Nolan, J. Addison (1991). "Distinguishing Between Amphibole Asbestos Fibers and Elongate Cleavage Fragments of Their Non-

Asbestos Analogues". Mechanisms in Fibre Carcinogenisis, R. C. Brown et al., editors, Plenum Press, New York. P 253 -267.

9. J. R. Verkouteren and A. G. Wylie (2002). "Anomalous Optical Properties of Fibrous Tremolite, Actinolite and Ferro-actinolite". American Mineralogist, 87, p 1090-1095.

10. R. J. Lee and R. M. Fisher (1979). "Identification of Fibrous and Nonfibrous Amphiboles in the Electron Microscope". Health Hazards of Asbestos Exposure, Annals of the New York Academy of Science, 330, p. 645-660.

11. D. W. Berman, K. S. Crump, E. J. Chatfield, J. M. G. Davis, and A. Jones (1995). "The Sizes, Shapes, and Mineralogy of Asbestos Structures that Induce Lung Tumors or Mesothelioma in AF/HAN rats Following Inhalation". Risk Analysis, 15:2, p 181-195.

12. D. W. Berman and K. S. Crump (1999). "Methodology for Conducting Risk Assessments at Asbestos Superfund Sites, Part 1: Protocol". Prepared for Kent Kitchingman, U.S. Environmental Protection Agency (EPA) EPA Contract No. 68-W9-0059, Work Assignment No. 59-06-D800, Final.

13. HEI-AR (1991). "Asbestos in Public and Commercial Buildings: A Literature Review and Synthesis of Current Knowledge".

14. NRC (1984). "Asbestiform Fibers-Nonoccupational Health Risks". Washington D.C., National Academy Press.

15. W. H. Walton (1982). "The Nature, Hazards and Assessment of Occupational Exposure to Airborne Asbestos Dust: A Review". Annals of Occupational Hygiene, 25, p 117-247.

16. R. J. Lee Group Inc. (2005). "Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project" Prepared for the National Stone, Sand and Gravel Association, Project LSH306975.

17. Occupational Safety and Health Administration (1986): "Final Rule Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite for Construction and General Industry". Federal Register v. 51. no. 119, June 20, 1986.

18. Occupational Safety and Health Administration (1992). "Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite: 29 CFR Parts 1910 and 1926 (Docket No. H-033-d)". Federal Register, v. 57, no. 110, June 8, 1992.

19. Y. Honda, C. Beall, E. Delzell, K. Oestenstad, I. Brill, and R. Matthews (2002). "Mortality Among Workers at a Talc Mining and Milling Facility". American Journal of Occupational Hygiene, 46, p. 575-585.

20. A. G. Wylie, K. F. Bailey, J. W. Kelse, R. J. Lee (1993). "The Importance of Width in Asbestos Fiber Carcinogenicity and Its Implications for Public Policy". American Industrial Hygiene Association Journal, 54(5) p. 239-252.

21. E. B. Illren (2004). "The Biology of Cleavage Fragments: A Brief Synthesis and Analysis of Current Knowledge". Indoor Building Environment, 13, p. 343-356.

22. ATSDR (2002). "Expert Panel on Health Effects of Asbestos and Synthetic Vitreous Fibers (SVF): The Influence of Fiber Length; Premeeting Comments". October 29-30, 2002, Agency for Toxic Substances and Disease Registry, New York, NY.

23. NSSGA (2002). National Stone, Sand and Gravel Association Panel Testimony before the Mine Safety and Health Administration (MSHA) on its Advanced Notice of Proposed Rulemaking for Asbestos, Charlottesville, VA, June 20, 2002.

24. K. F. Bailey, J. Kelse, A. G. Wylie, R. J. Lee (2002). "The Asbestiform and Prismatic Mineral Growth Habit and their Relationship to Cancer Studies". p. 64. Submitted to MSHA's Asbestos Docket, June, 2002.

25. R. L. Perkins and B. W. Harvey (1993). "Method for the Determination of Asbestos in Bulk Building Materials". U.S. Environmental Protection Agency, EPA/600/R-93/116, July 1993.

26. E. D. Kuempel, L. T. Stayner, J. D. Dement, S. J. Gilbert and M. J. Hein (2006). "Fiber Size-Specific Exposure Estimates and Updated Mortality Analysis of Chrysotile Asbestos Textile Workers". Presented at the Society of Toxicology Meeting, March 6, 2006.

27. A. G. Wylie and K. F. Bailey (1992). "The Mineralogy and Size of Airborne Chrysotile and Rock Fragments: Ramifications of Using the NIOSH 7400 Method". American Industrial Hygiene Association Journal 53 (7), p. 442-447.

28. U. S. Consumer Product Safety Commission (1988). "Briefing Package of the CPSC Office of the Secretary on a Petition to Ban Play Sand with Non-Asbestiform Tremolite". October 26, 1988,

29. U. S. Consumer Product Safety Commission (2000). " CPSC Staff Report on Asbestos Fibers in Children's Crayons". August 2000.

30. W. J. Campbell, R. L. Blake, L. L. Brown, E. E. Cather, J. J. Sjoberg (1977). "Selected Silicate Minerals and Their Asbestiform Varieties - Mineralogical Definitions and Identification - Characterization". U. S. Bureau of Mines, U. S. Department of Interior, Information Circular 8751, p. 1-55.

31. A. G. Wylie, R. J. Virta, and E. Russek (1985). "Characterizing and Discriminating Airborne Amphibole Cleavage Fragments and Amosite Fibers - Implications for the NIOSH Method". American Industrial Hygiene Association Journal 46(4), p. 197-201.

32. A. G. Wylie (1988). "Discriminating Amphibole Cleavage Fragments from Asbestos: Rationale and Methodology". Exposure Assessment and Control, Asbestos /Other Fibrous Material, p. 1065-1069.

33. D. W. Berman (2006). "Evaluation of the Approach recently Proposed for Assessing Asbestos-Related Risk in El Dorado County, California. Report to National Stone, Sand and Gravel Association.

34. A. G. Wylie (2005). Letter Review of the RJ Lee Inc. Report: "Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project". Prepared for the National Stone, Sand and Gravel Association, Project LSH306975.

35. A. M. Langer (2005). Letter Review of the RJ Lee Inc. Report: "Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project". Prepared for the National Stone, Sand and Gravel Association, Project LSH306975.

36. M. Ross (2005). Letter Review of the RJ Lee Inc. Report: "Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project". Prepared for the National Stone, Sand and Gravel Association, Project LSH306975.

37. J. Addison (2006). Letter Review of the RJ Lee Inc. Report: "Evaluation of EPA's Analytical Data from the El Dorado Hills Asbestos Evaluation Project". Prepared for the National Stone, Sand and Gravel Association, Project LSH306975. March 23, 2006.

38. C. Skinner (2006). Letter Review to Laura Gill, Chief Administrative Officer, El Dorado County, California Regarding the EPA Report and the R. J. Lee Group Report. February 24, 2006.

39. International Organization for Standardization (1995). "Ambient Air - Determination of Asbestos Fibers - Direct-Transfer Transmission Electron Microscopy Method". ISO 10312.

40. M. Dorling and J. Zussman (1987). "Characteristics of Asbestiform and Non-asbestiform Calcic Amphiboles". Lithos, 20, p. 469-489.

41. E.S. Dana (1920). "System of Mineralogy of James Dwight Dana 1837 -1898: Descriptive Mineralogy". 6th Edition, John Wiley and Sons, New York, p.1134.

42. G. Meeker (2006). "Letter to Dr. Vicki Barber, in Response to February 1, 2006 email to Robert Virta, USGS mineralogist, Regarding Questions of NOA Properties as Discussed in the RJ Lee Group Report.

43. National Institute of Standards and Technology (NIST). Certificate of Analysis for SRM 1867 and 1867a.

IONAL STONE, SAND & GRAVEL ASSOCIATION

Natural building blocks for quality of life

Position on Naturally Occurring Asbestos

Who Are We?

The National Stone, Sand & Gravel Association (NSSGA) represents the construction aggregates industry. Our member companies produce more than 92 percent of the crushed stone and 75 percent of the sand and gravel used annually in the United States. More than three billion tons of aggregates were produced in 2005 at a value of $17.4 billion, contributing $38 billion to the GDP of the United States. Every $1 million in aggregate sales creates 19.5 jobs, and every dollar of industry output returns $1.58 to the economy. Seventy percent of our nation's counties include an aggregates operation, and virtually every congressional district is home to a crushed stone, sand or gravel operation.

Why We're Here

- In 1986 the Occupational Safety and Health Administration promulgated a regulation that regulated common mineral rock fragments as asbestos. In 1992, <u>after six years of comprehensive review</u>, OSHA issued a final regulation, based on risk, which removed common rock fragments from its asbestos standard.
- Since 2003, NSSGA has re-briefed U.S. EPA in five different line offices on the importance of accurate mineral definitions. Briefing Headquarters decision-makers is the next step in the process.
- In the interim, EPA Region 9's work on naturally occurring asbestos in El Dorado County, California concerns us because it does not distinguish between common mineral rock fragments and asbestos. This omission creates the potential to once again overextend the regulatory process to common mineral rock fragments.
- The approach used by Region 9 in El Dorado County is inconsistent with Region 2's investigation of the Southdown Quarry in New Jersey. Region 9's approach will result in defining harmless rocks as asbestos, creating far-reaching consequences for other EPA regions and the regulated communities (i.e. construction, land developers, housing, school districts, and mining).
- Region 9's expansion of the regulatory definition of asbestos impacts over 30 percent of the United States land area, making this a national, not a regional, issue.

NSSGA's Position On Asbestos

- NSSGA supports strict regulation of harmful exposure to asbestos in commercial products as well as in the natural environment. Regulation and legislation addressing asbestos <u>must</u> have definitions, analytical methods and risk assessment procedures that are based on <u>sound science</u>.
- Definitions and methods must be sufficiently accurate and precise to differentiate regulated asbestos fibers from common rock fragments. Mineral fragments such as these have never been found to cause health effects like those associated with asbestos as evidenced by the fact that asbestos-related diseases have never been associated with the aggregates industry and there are no scientific studies in the literature reporting such health effects from these rock fragments. There are many published studies that show cleavage fragments do not cause asbestos-like diseases.
- In fact, EPA Region 9 has not shown any asbestos-like disease in El Dorado County.

NSSGA Requests That The U.S. Environmental Protection Agency Headquarters...

- Expeditiously initiate with an independent, neutral, qualified scientific body, preferably the Health Effects Institute (HEI), a review and study of the definition of the risk fibers in naturally occurring asbestos (both the definition and the method of measurement) and the development of a standard protocol for risk assessment and management when such materials exist in the natural environment. EPA has a 25-year history with HEI. HEI has addressed asbestos in the past. This is needed for both future regulatory and local risk assessment applications.
- Resolve the current inconsistency in assessing naturally occurring asbestos risk differently from region to region (as in the differences between Region 2 and Region 9).
- Hold in abeyance any regional office risk assessment involving naturally occurring asbestos until the conclusion of the Agency's review process.

1605 KING STREET ■ ALEXANDRIA, VA 22314
703 525 8788 ■ 800 342 1415 ■ FAX 703 525 7782
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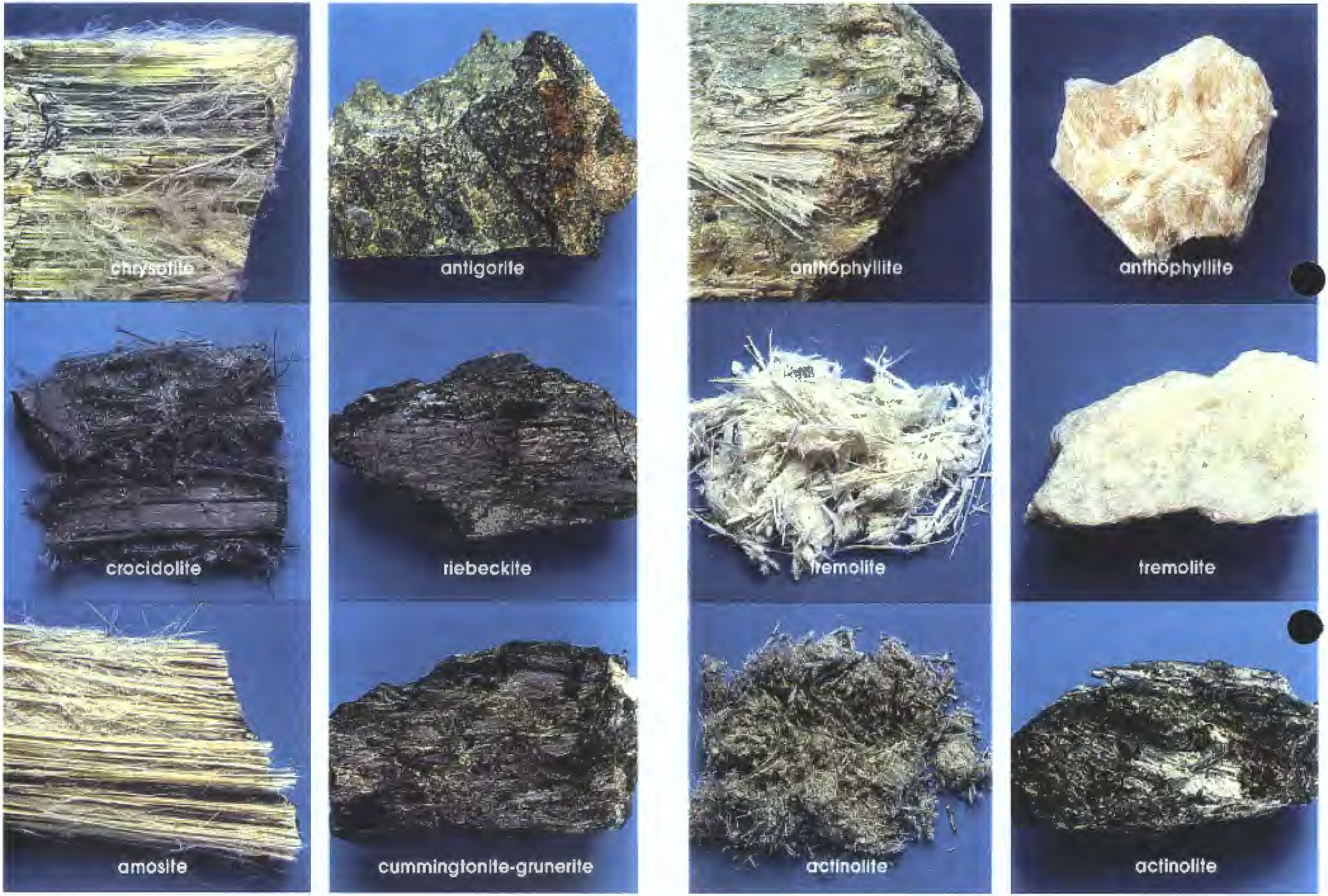
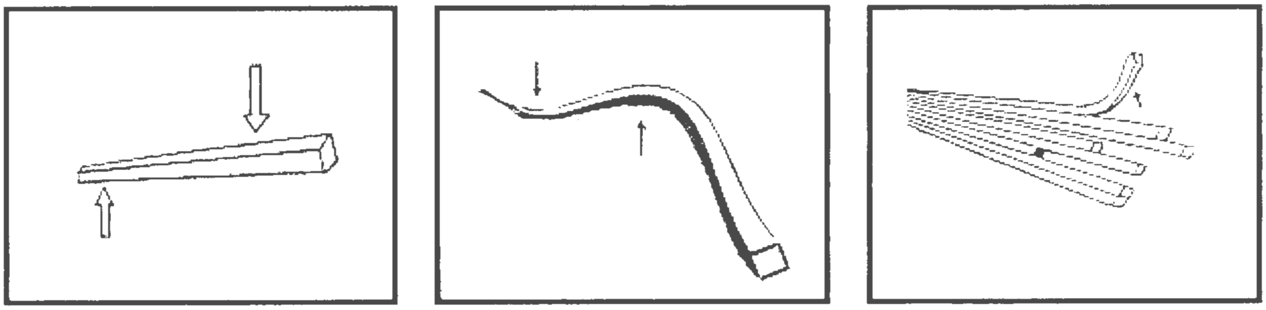
Asbestiform | Rocks | Asbestiform | Rocks

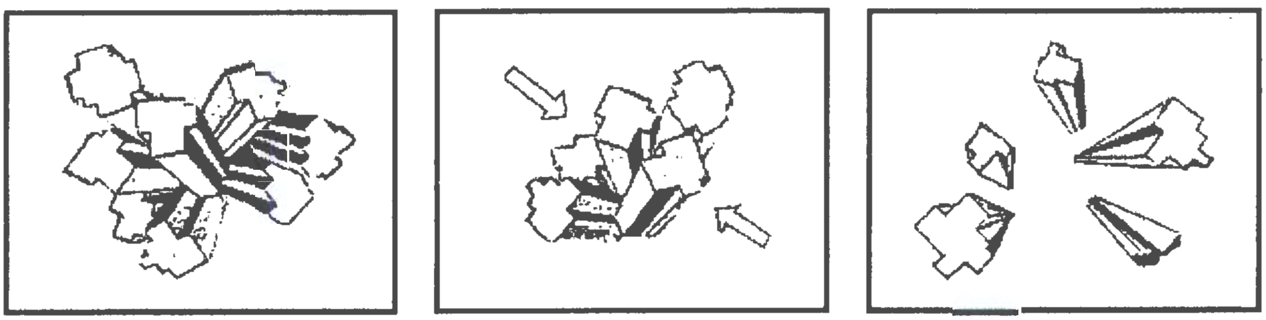


ASBESTIFORM

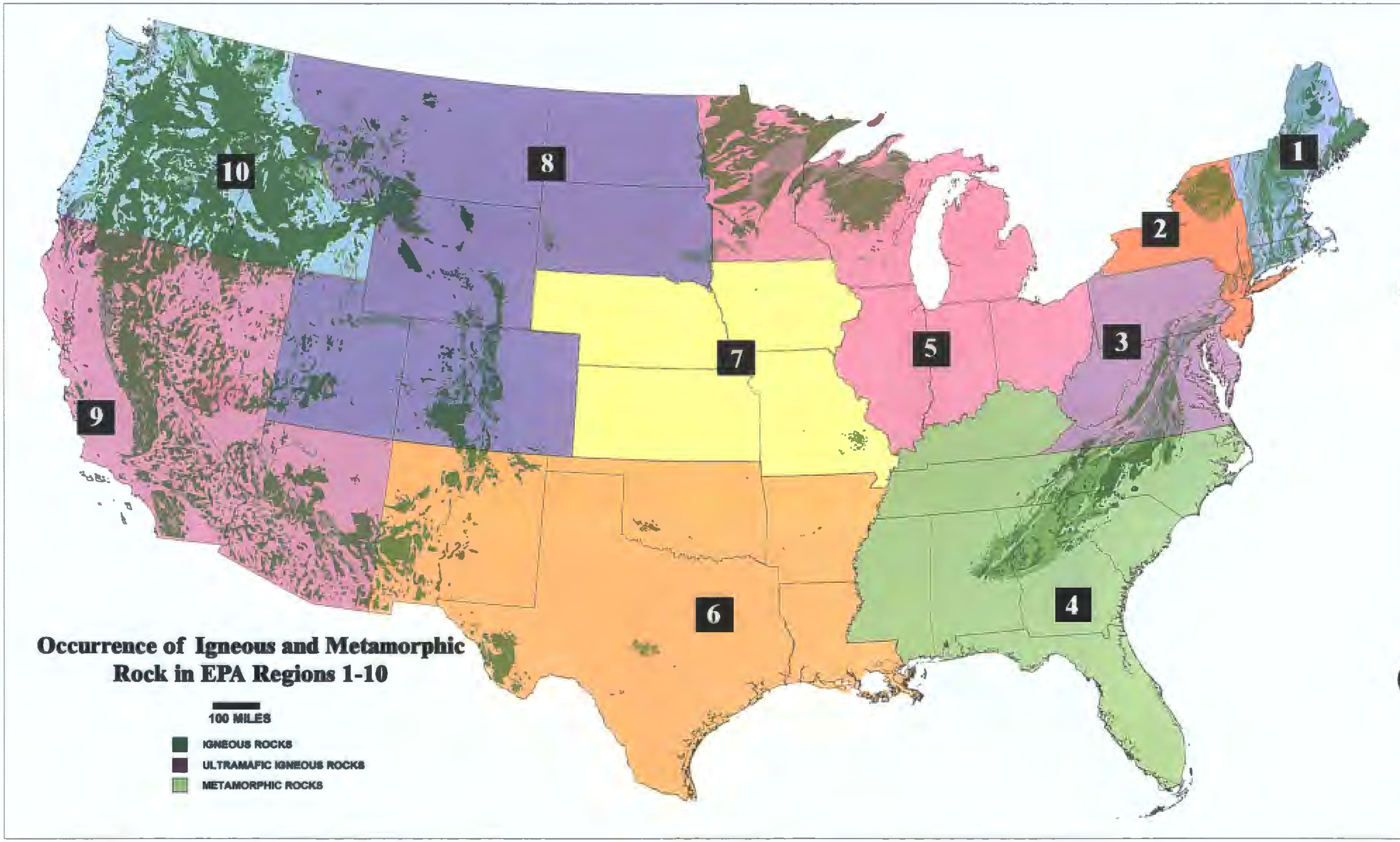


As the drawings above illustrate, asbestiform (asbestos-like) minerals consist of fibers that grow almost exclusively in one dimension, are easily bent and occur as bundles of smaller fibers, which are called fibrils. In fact, the bundling effect of asbestiform minerals is a unique distinguishing feature. Some asbestiform minerals display splayed ends. Asbestiform minerals also are long and thin, with aspect (length-to-width) ratios of typically 20:1 to 100:1 or greater. Most asbestiform fibers are less than 0.1 microns in width, and nearly all are less than 0.5 micron. Individual fibers are only visible with the aid of a microscope.

ROCKS



Unlike asbestiform minerals, ordinary rock-forming minerals grow in several directions at once. Under pressure, unlike asbestiform minerals which bend, ordinary rock-forming minerals fracture easily into particles called cleavage fragments. Of those, some are needle-shaped (acicular), and some show stair-step cleavage patterns. Cleavage fragments tend to be shorter and thicker than their asbestiform counterparts; nearly all have widths that exceed 0.5 microns and lengths below about 10 microns.


Occurrence of Igneous and Metamorphic Rock in EPA Regions 1-10
100 MILES
IGNEOUS ROCKS
ULTRAMAFIC IGNEOUS ROCKS
METAMORPHIC ROCKS
1
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3
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10

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Figure 1a. Optical Image of Chrysotile Grade 3 (textile grade).

Figure 1b. SEM Image of Chrysotile Grade 3 (textile grade).

Figure 2a. Optical Image of Chrysotile Grade 4 (insulation/cement pipe grade).

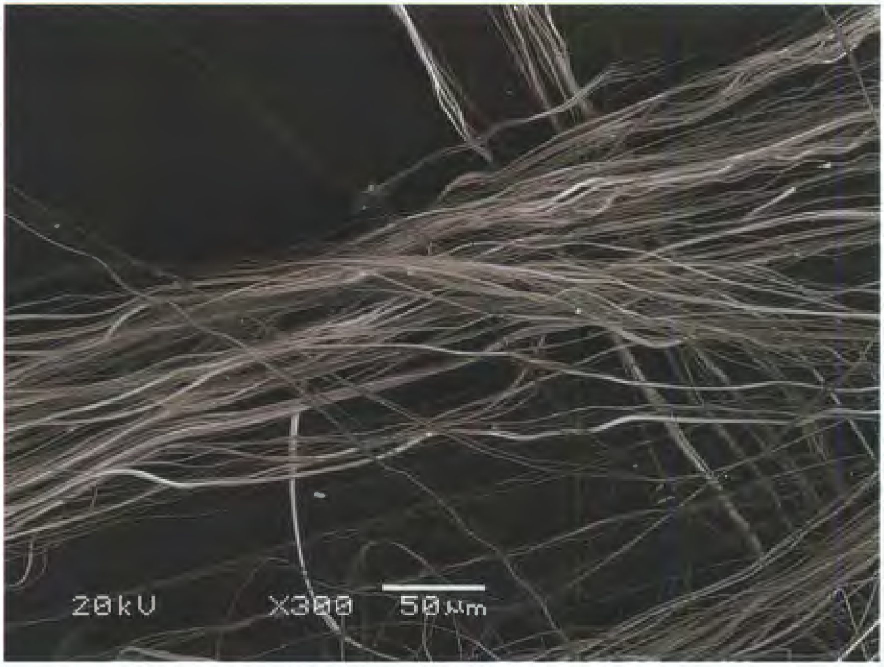

Figure 2b. SEM Image of Chrysotile Grade 4 (insulation/cement pipe grade).

Figure 3a. Optical Image of Chrysotile Grade 7 (friction parts grade).

Figure 3b. SEM Image of Chrysotile Grade 7 (friction parts grade).

Figure 4a. Optical Image of Chrysotile Ore (Quebec chrysotile miner exposure).

Figure 4b. SEM Image of Chrysotile Ore (Quebec chrysotile miner exposure).

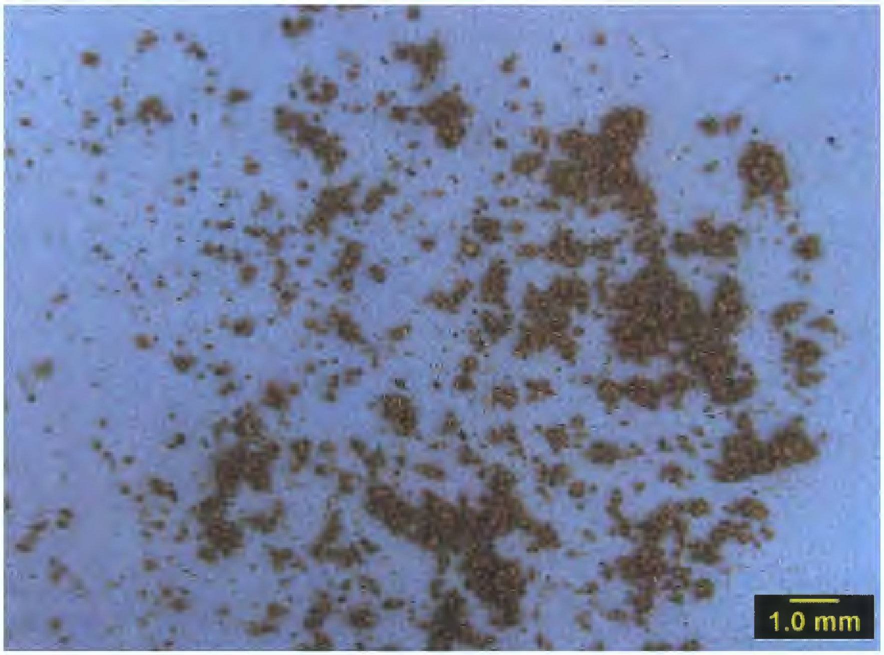

Figure 5a. Optical Image of Eldorado Hills EPA Soil Sample.

Figure 5b. SEM Image of Eldorado Hills EPA Soil Sample.